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Needle reuse 'jump-started' HIV pandemic

Research finds injections behind early spread of the virus in Africa



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Changes in sexual behaviour at a time when cities were growing in sub-Saharan Africa are often cited as reasons behind the spread of the human immunodeficiency virus (HIV) after it emerged. But two research studies^{1,2} published in *Clinical Infectious Diseases* now lend support to a less prominent hypothesis: that the virus spread through needles and syringes used to treat endemic infections, such as malaria and trypanosomiasis.

"Iatrogenic exposures may have jump-started the HIV pandemic from a few isolated cases of infected persons exposed to 'bush meat'," writes Thomas Strickland, of the University of Maryland School of Medicine, USA, in a commentary³ that accompanies the articles. "This markedly increased the reservoir of infection and led to sustained human-to-human sexual transmission."

Although medical procedures are now safer, the research suggests that other zoonotic pathogens could take hold in human populations in this way once they cross the species barrier.

The hypothesis that medical interventions played a part in the early emergence of HIV was investigated by a team of researchers led by Jacques Pépin of the Université de Sherbrooke in Québec, Canada. Working in rural parts of southern Cameroon and southeastern Central African Republic, they found that two blood-borne viruses — hepatitis C and human T lymphotropic virus (HTLV)-1 — were passed on to people treated with reused medical equipment during infection control programmes in the first half of the 20th century.

The two viruses served as surrogates for HIV. "Both of the rural areas... are near sites where SIV_{cpz} [simian immunodeficiency virus], believed to be the precursor of [HIV]-1, has been isolated from chimpanzees," says Strickland.

Data "convincing"

In Cameroon, Pépin and colleagues surveyed people over 60 years of age, collecting basic demographic information and asking about their medical history, also testing their blood for antibodies and gene fragments of the hepatitis C virus — respectively indicating past and current infection. Getting treated for malaria intravenously, having blood transfusions, and being circumcised were each associated significantly with a high risk of infection with the virus.

The researchers adopted a similar approach in a study of over 55-year-olds in the Central African Republic. They found the risk of infection with HTLV-1 to be associated primarily with intramuscular injections of medicine against trypanosomiasis between 1947 and 1953. Treatment for this disease was also associated with the spread of a genotype of the hepatitis C virus.

Strickland finds the data convincing, adding that the circumstances described by the authors "meet several requirements for iatrogenic blood-borne infection epidemics".

Back then doctors didn't know that blood could transmit infections, and had no access to disposable needles or syringes, he explains. People usually received more than one treatment to complete the course, and in some cases several patients would be treated at the same time. Older people with a higher chance of carrying a virus would often receive medical care at the same location as children.

Proof by proxy

"The hypothesis that transmission of HIV-1 during parenteral therapy of endemic infectious diseases... jump-started the HIV pandemic in Equatorial Africa is exceedingly insightful," says Strickland.

This explanation has been favoured by some scientists for several years. But it was "impossible to prove", explains Strickland, because HIV would have killed those infected at the time.

David Gisselquist, an independent consultant based in Pennsylvania, USA, points to publications that have put across the same theory. Although in some cases the details on timing of spread vary, they suggest that unsterile injections and transfusions had a role in the spread of blood-borne viruses.

Gisselquist believes that this is a more plausible explanation of HIV emergence than changes in sexual behaviour and

urbanisation. "Hetero[sexual] transmission alone did not transmit HIV fast enough for it to survive and spread. So why should African sex suddenly change so dramatically in the early 20th century to cause epidemics?"

What did change at that time was the introduction of invasive healthcare interventions on a large scale, says Gisselquist, first through colonial infection control programmes and subsequently with international aid-funded projects. Pépin and colleagues agree, saying the well intentioned programmes had serious unintended consequences.

"I don't know of any other plausible explanation for increasing the reservoir of infection this much," notes Strickland in an email. But he adds that after a "pool" of infection was built up, social changes leading to an increase in sexual transmission of the virus would have come into play.

Not just HIV

"There is a definite possibility that unsafe health care is spreading not only HIV in Africa, but also other and unknown pathogens," says Gisselquist.

Writing in the commentary, Strickland highlights the public health burden of hepatitis C. Infections picked up years ago, now chronic, are leading to liver cirrhosis and driving up the incidence of hepatocellular carcinoma worldwide, he says.

Both HIV and hepatitis C viruses survive for prolonged periods outside the body. The first study to determine the survival of hepatitis C in syringes, **published recently** in the *Journal of Infectious Diseases*, found that the virus can persist for up to two months — underscoring the **importance of needle-exchange programmes** in reducing transmission.

"The only countries in the world in which HIV invades the general population are countries which do not enforce standard precautions in health care," says Gisselquist. "Those are also countries with parallel epidemics of HCV [hepatitis C] and/or HBV [hepatitis B]."

Medical practices have improved but remain unsafe in Africa, according to Gisselquist — but although UN institutions warn their own staff about the risk, the problem is "routinely neglected" in fear of causing alarm among the public. "The health aid community and international health agencies have not responded to clean up Africa's health care practices, but have rather tried to silence those who would raise issues."

But he stresses that for HIV, exposures from sex as well as infected blood need to be addressed to tackle the problem.

References and links

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2. Pépin J, Labbé AC, Mamadou-Yaya F, Mbélesso P, Mbadingaï S, Deslandes S, *et al.* Iatrogenic transmission of human T cell lymphotropic virus type 1 and hepatitis C virus through parenteral treatment and chemoprophylaxis of sleeping sickness in colonial Equatorial Africa. *Clin Infect Dis* 2010, **51**:777–84. doi: [10.1086/656232](https://doi.org/10.1086/656232)
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